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RESEARCH ARTICLE

Dragonflies and Damselflies (Odonata: Insecta) of the Bor Wildlife Sanctuary, Wardha, Maharashtra, Central India

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Abstract

Dragonfly and damselfly (Odonata) species diversity was studied in the Bor wildlife sanctuary from 2011 to 2018. A total of 72 species of odonates belonging to 8 families were recorded. The study adds three new species for the Vidarbha region. The highest number of odonates belonged to the family Libellulidae (31 species) followed by Coenagrionidae (15 species), and Aeshnidae (six species). Of the total, 30 species were very common, 18 were common, seven were frequent common, 11 rare and six very rare. Among all, six species were Data Deficient, *Indothemis carnatica* (Fabricius, 1798) is listed as Near Threatened and 64 were Least Concern, in IUCN red-list of threatened species. The observations support the value of the wildlife sanctuary area in providing valuable resources for Odonata.

Keywords

Odonata, diversity, Bor Wildlife Sanctuary, Wardha, Mahrashtra, India

Introduction

Odonata (damselflies and dragonflies) is one of the oldest and amphibious insect order, with origins spanning back to Carboniferous era, about 250 million years ago. Dragonflies are very interesting and diverse insects. Odonates are freshwater insects and play an important role in wetland and terrestrial food chains as predators. The adults are generally predacious, while the larvae are carnivorous and voracious feed-

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ers (Andrew et al. 2008). They are also actively used in controlling causative agent of malaria and filaria throughout the world (Tiple et al. 2008). Even though species are usually highly specific to a certain habitat, some have adapted to urbanization and use man-made water bodies. They probably mark the first time that evolution experimented with the ability to hover in air over an object of interest. Being primarily aquatic, their life history is closely linked to specific aquatic habitats. Naturally, these insects become a marker, an indicator of wetland health (Andrew et al., 2008).

Odonates are good indicators of environmental changes as they are sensitive and are directly affected by changes in the habitat, atmospheric temperature and weather conditions (Dijkstra and Lewington 2006). They also act as bio-control agents, many species of odonates, inhabiting agro ecosystems, play a crucial role in controlling pest populations (Tiple et al. 2013).

Globally 6338 species in 693 genera of odonates have been reported (Schorr and Paulson 2020), of which 496 species, 27 subspecies in 154 genera and 18 families are known from India (Subramanian and Babu 2020; Joshi and Sawant 2020; Bedjanič et al. 2020; Payra et al. 2020). After Fraser's seminal work on Odonata of India (Fraser 1933, 1934, 1936), there was a gap of almost 50 years in Odonata studies across the country. After establishing the Zoological Survey of India (ZSI) in 1916, trained taxonomists started collecting data and publishing lists of Odonata of localities or regions. Researchers from the ZSI and various odonatologists from the academic institutes of India have often surveyed various parts of Maharashtra region. The odonata fauna of the State of Maharashtra is well-documented with 134 species (*reviewed in* Tiple and Koparde 2015), but few spatial gaps still remain. The eastern part of the State of Maharashtra (Vidarbha) is home to 85 odonates (Tiple et al. 2013; Tiple et al. 2014; Talmale and Tiple 2013, Tiple 2015). Bor Wildlife sanctuary is one such locality from where the information on Odonata fauna is lacking till date. No published checklist of Odonata species of Bor Wildlife Sanctuary region is known, hence, the present work was initiated.

Bor Wildlife Sanctuary (20° 57' N and 78° 37' E) was declared a tiger reserve in July 2014. It is located near Hingani in Wardha District, Maharashtra. Home to an assortment of wild animal, the reserve covers a zone of 138.12 km^2 (53.33 sq. mi.), which incorporates the drainage basin of the Bor Dam. Bor Wildlife sanctuary is covered with the southern mixed dry deciduous forest. The Bor Wildlife sanctuary represents the ecological wealth of Satpuda-Maikal Landscape (Tiple 2018).

The eastern Maharashtra region (Vidarbha) has three main seasons: the wet monsoon season from June to October, the cool dry winter from October to March, and the hot dry season from April till the onset of the rains in the beginning of June. The temperature of the Vidarbha ranges from a minimum of 12–25°C to a maximum of 30–48°C, with relative humidity varying from 10–15% to 60–95%. Average annual precipitation is 1700 mm. About 90% of the precipitation takes place from June to September (Tiple 2018). The forest types found in this area are classified as sub-tropical hill forests, tropical moist deciduous forests and tropical dry deciduous forests (Champion and Seth 1968).

Materials and methods

Odonates were photographed and identified in different regions of the Bor Wildlife Sanctuary between 2011 to 2018. Most of the sampling was done between 10 AM to 2 PM, when odonates are most active (Subramanian 2009; Payra and Tiple 2019). Odonates were surveyed in the buffer zone of the reserve, near temporary and permanent flowing or still water bodies and surrounding areas, during the monsoon and post monsoon periods (Fig. 1). A biweekly survey was undertaken during the monsoon (July–August) and post monsoon (September–Octomber). The adult odonates were identified with the help of identification keys provided by Fraser (1933, 1934, 1936) and Mitra (1986). All nomenclature follows Subramanian and Babu (2017). The species were categorized on the basis of their abundance in Bor Wildlife Sanctuary VC Very common (>100 sightings), C Common (50–100 sightings), FC frequent common (15–50 sightings), R Rare (2–15 sightings), VR Very rare (< 2 sightings) (Tiple et al. 2012; Tiple and Koparde 2015).

Results and discussion

During the study, 72 species of odonates belonging to eight families were recorded, of which three were new records for the Vidarbha region (Tiple et al. 2013). The highest number of odonates belonged to the family Libellulidae (31 species), followed by Coenagrionidae (15 species), Aeshnidae (six species), Gomphidae (seven species), Platycenemididae (four species) and Lestidae (five species), Macromiidae (three species) and Chlorocyphidae (one species). Of the total, 30 species were very common, 18 were common, seven were frequent common, 11 rare and six very rare. In Table 1, the species recorded for the first time from the Vidarbha region are marked with asterisks, *Gomphidia t-nigrum*, *Macromia cingulata*, *Elattoneura nigerrima* (see Figs 2–4).

Among the 72 odonates recorded from Bor Wildlife Sanctuary, only *Indothemis carnatica* is categorised as Near Threatened, 65 as Least Concern and the rest as Data Deficient (Table 1). Gomphidae family is represented by the highest number of Data Deficient species, for which information is not available in the IUCN red list of threatened species (Table 1). Members of this family are fast moving insects, some have crepuscular habits and many are already rare, therefore, there are high chances of not detecting them during surveys (Tiple and Koparde 2015). Libellulidae (31) and Coenagrionidae (15) families are dominant in Bor Wildlife Sanctuary.

Pantala flavescens is abundant during monsoon and post-monsoon periods as a result of mass emergence and migration. *Brachythemis contaminata, Orthetrum sabina, Bradinopyga geminata, Ceriagrion coromandelianum, Agriocnemis pygmaea* were commonly sighted in human settlement areas and their presence is indicative of polluted waters. Species like *Elattoneura nigerrima*, *Macromia flavicincta, Rhodothemis rufa*, *Gomphidia t-nigrum, Lestes nodalis, Aciagrion occidentale* were

Figure 1. Natural habitats of Bor Wildlife Sanctuary, Wardha.

Table 1. Checklist of Odonata of Bor Wildlife Sanctuary. **OS:** Occurrence status; **TS:** Threat status as assigned from IUCN (2020). NA: Not available; LC: Least concern; DD: Data deficient; VU: Vulnerable; NT: Near threatened

No.	Scientific name	OS	TS
	Suborder Anisoptera (Dragonflies) **Family Aeshnidae (06)**		
1.	*Anax guttatus* (Burmeister, 1839)	NR	LC
2.	*Anax immaculifrons* (Rambur, 1842)	C	LC
3.	*Anax indicus* Lieftinck, 1942	VC	LC
4.	*Anax parthenope* (Selys, 1839)	R	LC
5.	*Gynacantha bayadera* Selys, 1891	C	LC
6.	*Anax ephippiger* (Burmeister, 1839)	NR	LC
	Family Gomphidae (07)		
7.	*Gomphidia t-nigrum* Selys, 1854*	VR	LC
8.	*Ictinogomphus rapax* (Rambur, 1842)	VC	LC
9.	*Ictinogomphus distinctus* Ram, 1985	R	DD
10.	*Ictinogomphus angulosus* (Selys, 1854)	R	LC
11.	*Macrogomphus annulatus* (Selys, 1854)	C	DD
12.	*Microgomphus torquatus* Selys, 1854	R	DD
13.	*Paragomphus lineatus* (Selys, 1850)	VC	LC
	Family Libellulidae (31)		
14.	*Acisoma panorpoides* Rambur, 1842	C	LC
15.	*Brachydiplax sobrina* (Rambur, 1842)	NR	LC
16.	*Brachythemis contaminata* (Fabricius, 1793)	VC	LC
17.	*Bradinopyga geminata* (Rambur, 1842)	VC	LC
18.	*Crocothemis servilia* (Drury, 1770)	VC	LC
19.	*Diplacodes lefebvrii* (Rambur, 1842)	R	LC
20.	*Diplacodes nebulosa* (Fabricius, 1793)	R	LC
21.	*Diplacodes trivialis* (Rambur, 1842)	VC	LC
22.	*Indothemis carnatica* (Fabricius, 1798)	R	NT
23.	*Lathrecista asiatica* (Fabricius, 1798)	C	LC
24.	*Neurothemis intermedia* (Rambur, 1842)	VC	LC
25.	*Neurothemis tullia* (Drury, 1773)	C	LC
26.	*Orthetrum sabina* (Drury, 1773)	VC	LC
27.	*Orthetrum chrysis* (Selys, 1891)	NR	LC
28.	*Orthetrum glaucum* (Brauer, 1865)	C	LC
29.	*Orthetrum luzonicum* (Brauer, 1868)	VC	LC
30.	*Orthetrum pruinosum* (Burmeister, 1839)	VC	LC
31.	*Orthetrum taeniolatum* (Schneider, 1845)	C	LC
32.	*Pantala flavescens* (Fabricius, 1798)	VC	LC
33.	*Potamarcha congener* (Rambur, 1842)	VC	LC
34.	*Rhodothemis rufa* (Rambur, 1842)	VR	LC
35.	*Rhyothemis variegata* (Linnaeus, 1763)	VC	LC
36.	*Tholymis tillarga* (Fabricius, 1798)	C	LC

Table 1. (continued)

No.	Scientific name	OS	TS
37.	*Tramea basilaris* (Palisot de Beauvois, 1807)	C	LC
38.	*Tramea limbata* (Desjardins, 1832)	C	LC
39.	*Trithemis aurora* (Burmeister, 1839)	VC	LC
40.	*Trithemis festiva* (Rambur, 1842)	VC	LC
41.	*Trithemis kirbyi* Selys, 1891	NR	LC
42.	*Trithemis pallidinervis* (Kirby, 1889)	VC	LC
43.	*Urothemis signata* Rambur, 1842	R	LC
44.	*Zyxomma petiolatum* Rambur, 1842	C	LC
	Family Macromiidae (03)		
45.	*Epophthalmia vittata* Burmeister, 1839	C	LC
46.	*Macromia flavicincta* Selys, 1874	VR	DD
47.	*Macromia cingulata* Rambur, 1842*	C	LC
	Suborder Zygoptera (Damselflies) **Family Chlorocyphidae (01)**		
48.	*Libellago indica* (Burmeister, 1839)	VC	LC
	Family Coenagrionidae (15)		
49.	*Aciagrion pallidum* (Selys, 1891)	R	LC
50.	*Aciagrion occidentale* Laidlaw, 1919	VR	LC
51.	*Agriocnemis pygmaea* (Rambur, 1842)	VC	LC
52.	*Paracercion calamorum* (Ris, 1916)	C	LC
53.	*Paracercion malayanum* (Selys, 1876)	C	LC
54.	*Ceriagrion coromandelianum* (Fabricius, 1798)	VC	LC
55.	*Enallagma parvum* (Selys, 1876)	VC	LC
56.	*Ischnura rubilio* (Brauer, 1865)	VC	LC
57.	*Ischnura senegalensis* (Rambur, 1842)	VC	LC
58.	*Pseudagrion spencei* Fraser, 1922	NR	LC
59.	*Pseudagrion decorum* (Rambur, 1842)	VC	LC
60.	*Pseudagrion hypermelas* (Selys, 1876)	R	LC
61.	*Pseudagrion microcephalum* (Rambur, 1842)	C	LC
62.	*Pseudagrion rubriceps* (Selys, 1876b)	VC	LC
63.	*Ischnura nursei* (Morton, 1907)	VC	LC
	Family Lestidae (05)		
64.	*Lestes elatus* Hagen in Selys, 1862	VR	LC
65.	*Lestes umbrinus* Selys, 1891	VC	DD
66.	*Lestes thoracicus* Laidlaw, 1920	R	LC
67.	*Lestes viridulus* Rambur, 1842	VC	LC
68.	*Lestes nodalis* Selys, 1891	VR	LC
	Family Platycnemididae (04)		
69.	*Copera marginipes* (Rambur, 1842)	VC	LC
70.	*Copera vittata* Selys, 1863	C	LC
71.	*Disparoneura quadrimaculata* (Rambur, 1842)	VC	LC
72.	*Elattoneura nigerrima* (Laidlaw, 1917)*	NR	DD

Figure 2. *Gomphidia t-nigrum.*

Figure 3. *Macromia cingulata.*

Figure 4. *Elattoneura nigerrima.*

rarely encountered. Members of Gomphidae, Macromiidae, Chlorocyphidae and Platycnemididae families were not found in contaminated water but occured near unpolluted water. Human development activity is expected to have a negative impact on Odonata populations, primarily because of building construction and concrete replacing or reducing the area of natural and semi-natural habitats (Tiple et al. 2013). The quality of residual habitats may also be adversely affected by various forms of pollutants (Tiple and Chandra 2013).

The present study captured 85% of the total species reported in Vidarbha Region and 52% of the species reported in Maharashtra State. The Bor Wildlife Sanctuary seems to be having rich Odonata diversity, probably due to the presence of rivers, lakes and other wetlands with dense shrub and tree vegetation a major attraction to the Odonata species. The observations recorded in the present study may prove valuable as a reference for assessing the changes due to the environmental conditions in the area, in future.

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